FIG. 1A

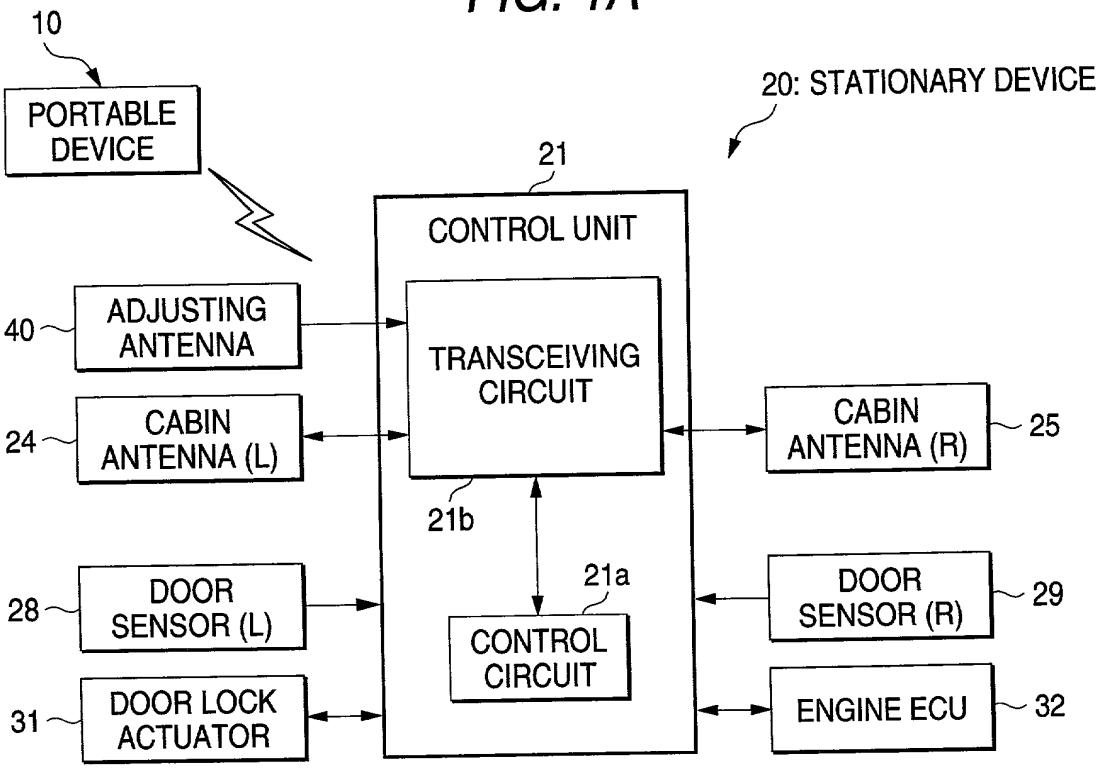
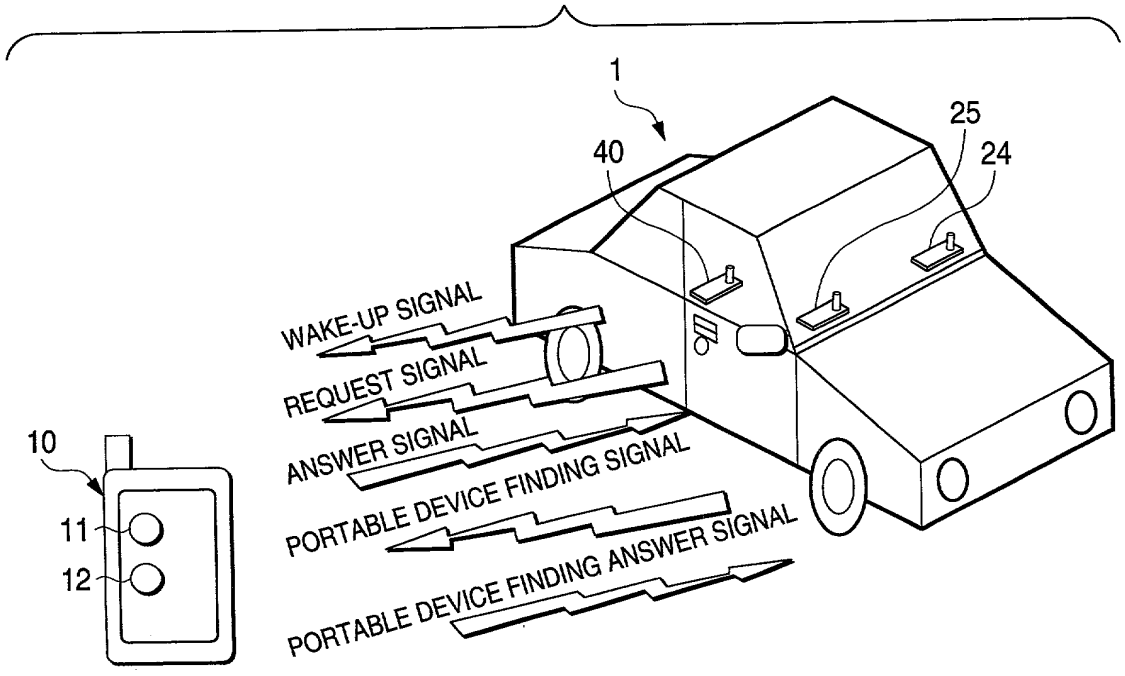

10
PORTABLE DEVICE
20: STATIONARY DEVICE
21
CONTROL UNIT
40
ADJUSTING ANTENNA
TRANSCEIVING CIRCUIT
24
CABIN ANTENNA (L)
CABIN ANTENNA (R)
25
21b
21a
28
DOOR SENSOR (L)
CONTROL CIRCUIT
DOOR SENSOR (R)
29
31
DOOR LOCK ACTUATOR
ENGINE ECU
32

FIG. 1B


1
40
25
24
WAKE-UP SIGNAL
REQUEST SIGNAL
ANSWER SIGNAL
PORTABLE DEVICE FINDING SIGNAL
PORTABLE DEVICE FINDING ANSWER SIGNAL
10
11
12

TOETT 2E2Tn660

FIG. 2

PORTABLE DEVICE POSITION	AREA		RELATIONS OF THE TRANSMISSION INTENSITIES FROM THE TWO ANTENNAS		
			Pt (D1) > Pt (A1)	Pt (D2) = Pt (A2)	Pt (D3) < Pt (A3)
OUTSIDE THE VEHICLE ON THE DRIVER'S SEAT	Dout		E (D1) > > E (A1)	E (D2) > > E (A2)	E (D3) > E (A3)
NEAR THE DRIVER'S SEAT	Dd	NEAR THE DOOR	E (D1) > E (A1)	E (D2) > E (A2)	E (D3) > E (A3)
	Dc	CENTER OF THE DRIVER'S SEAT	E (D1) > E (A1)	E (D2) > E (A2)	E (D3) = E (A3)
	Dcc	NEAR THE CENTER OF THE VEHICLE	E (D1) > E (A1)	E (D2) > E (A2)	E (D3) < E (A3)
ON THE CENTER LINE OF THE VEHICLE	C		E (D1) > E (A1)	E (D2) = E (A2)	E (D3) < E (A3)
NEAR THE ASSISTANT DRIVER'S SEAT	Acc	NEAR THE CENTER OF THE VEHICLE	E (D1) > E (A1)	E (D2) < E (A2)	E (D3) < E (A3)
	Ac	CENTER OF THE ASSISTANT DRIVER'S SEAT	E (D1) = E (A1)	E (D2) < E (A2)	E (D3) < E (A3)
	Ad	NEAR THE DOOR	E (D1) < E (A1)	E (D2) < E (A2)	E (D3) < E (A3)
OUTSIDE THE VEHICLE ON THE ASSISTANT DRIVER'S SEAT	Aout		E (D1) < < E (A1)	E (D2) < < E (A2)	E (D3) < < E (A3)

FIG. 3

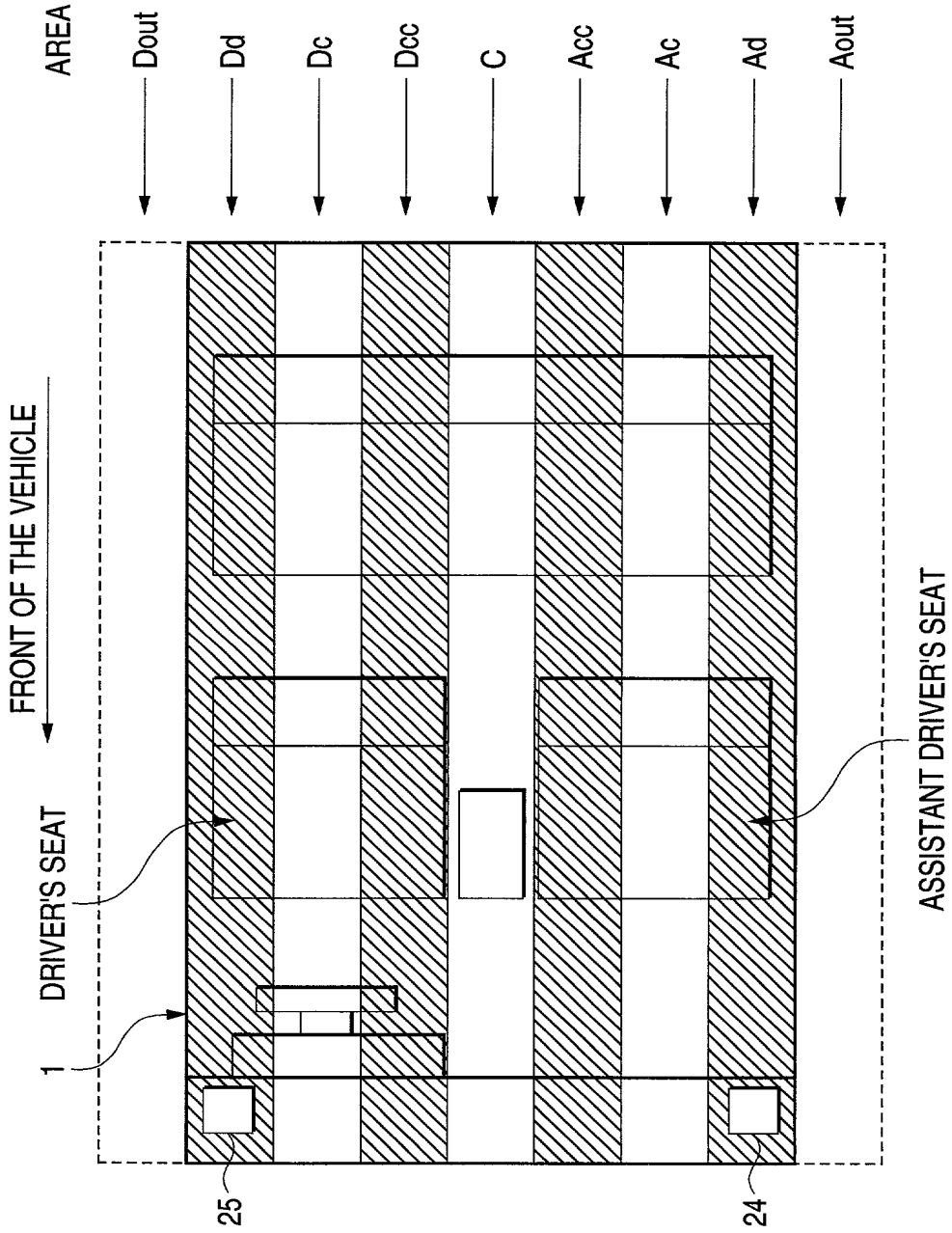

AREA
Dout
Dd
Dc
Dcc
C
Acc
Ac
Ad
Aout
FRONT OF THE VEHICLE
DRIVER'S SEAT
ASSISTANT DRIVER'S SEAT
1
25
24

FIG. 4A

MODE	
1	E (D) > > E (A)
2	E (D) > E (A)
3	E (D) = E (A)
4	E (D) < E (A)
5	E (D) < < E (A)

FIG. 4B

AREA	MODE CONBINATION
Dout	112
Dd	222
Dc	223
Dcc	224
C	234
Acc	244
Ac	344
Ad	444
Aout	455

FIG. 5

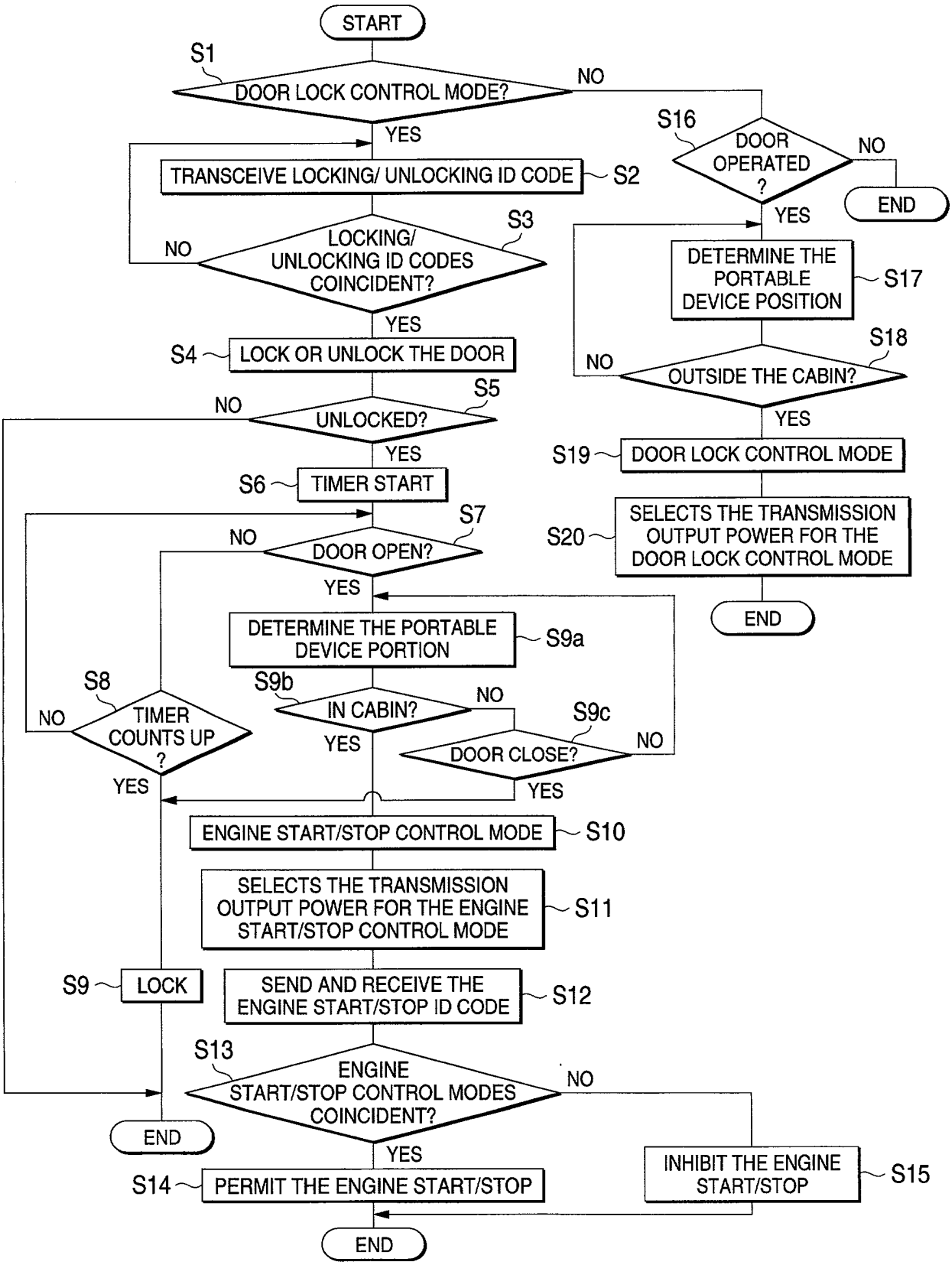

START
S1
DOOR LOCK CONTROL MODE?
NO
YES
TRANSCEIVE LOCKING/ UNLOCKING ID CODE
S2
S3
LOCKING/ UNLOCKING ID CODES COINCIDENT?
NO
YES
S4
LOCK OR UNLOCK THE DOOR
S5
UNLOCKED?
NO
YES
S6
TIMER START
S7
DOOR OPEN?
NO
YES
DETERMINE THE PORTABLE DEVICE PORTION
S9a
S8
TIMER COUNTS UP ?
NO
YES
S9b
IN CABIN?
NO
YES
S9c
DOOR CLOSE?
NO
YES
ENGINE START/STOP CONTROL MODE
S10
SELECTS THE TRANSMISSION OUTPUT POWER FOR THE ENGINE START/STOP CONTROL MODE
S11
S9
LOCK
SEND AND RECEIVE THE ENGINE START/STOP ID CODE
S12
S13
ENGINE START/STOP CONTROL MODES COINCIDENT?
NO
YES
END
S14
PERMIT THE ENGINE START/STOP
INHIBIT THE ENGINE START/STOP
S15
END
S16
DOOR OPERATED ?
NO
YES
END
DETERMINE THE PORTABLE DEVICE POSITION
S17
S18
OUTSIDE THE CABIN?
NO
YES
S19
DOOR LOCK CONTROL MODE
S20
SELECTS THE TRANSMISSION OUTPUT POWER FOR THE DOOR LOCK CONTROL MODE
END

FIG. 6

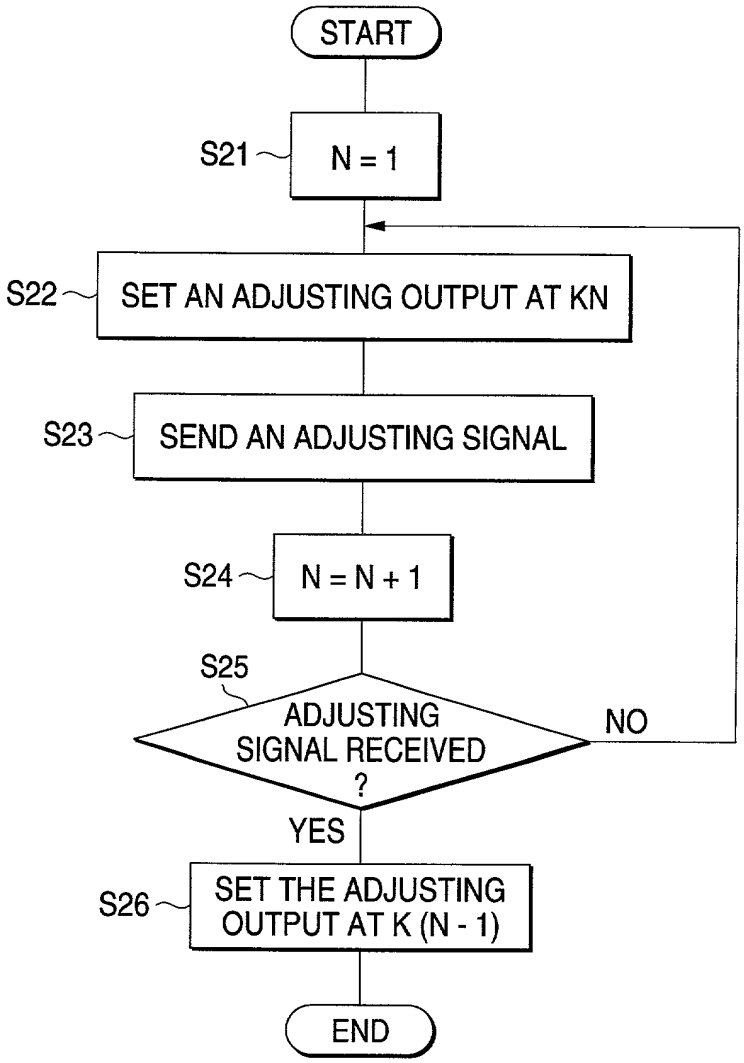

START
S21
N = 1
S22
SET AN ADJUSTING OUTPUT AT KN
S23
SEND AN ADJUSTING SIGNAL
S24
N = N + 1
S25
ADJUSTING SIGNAL RECEIVED ?
NO
YES
S26
SET THE ADJUSTING OUTPUT AT K (N - 1)
END

FIG. 7

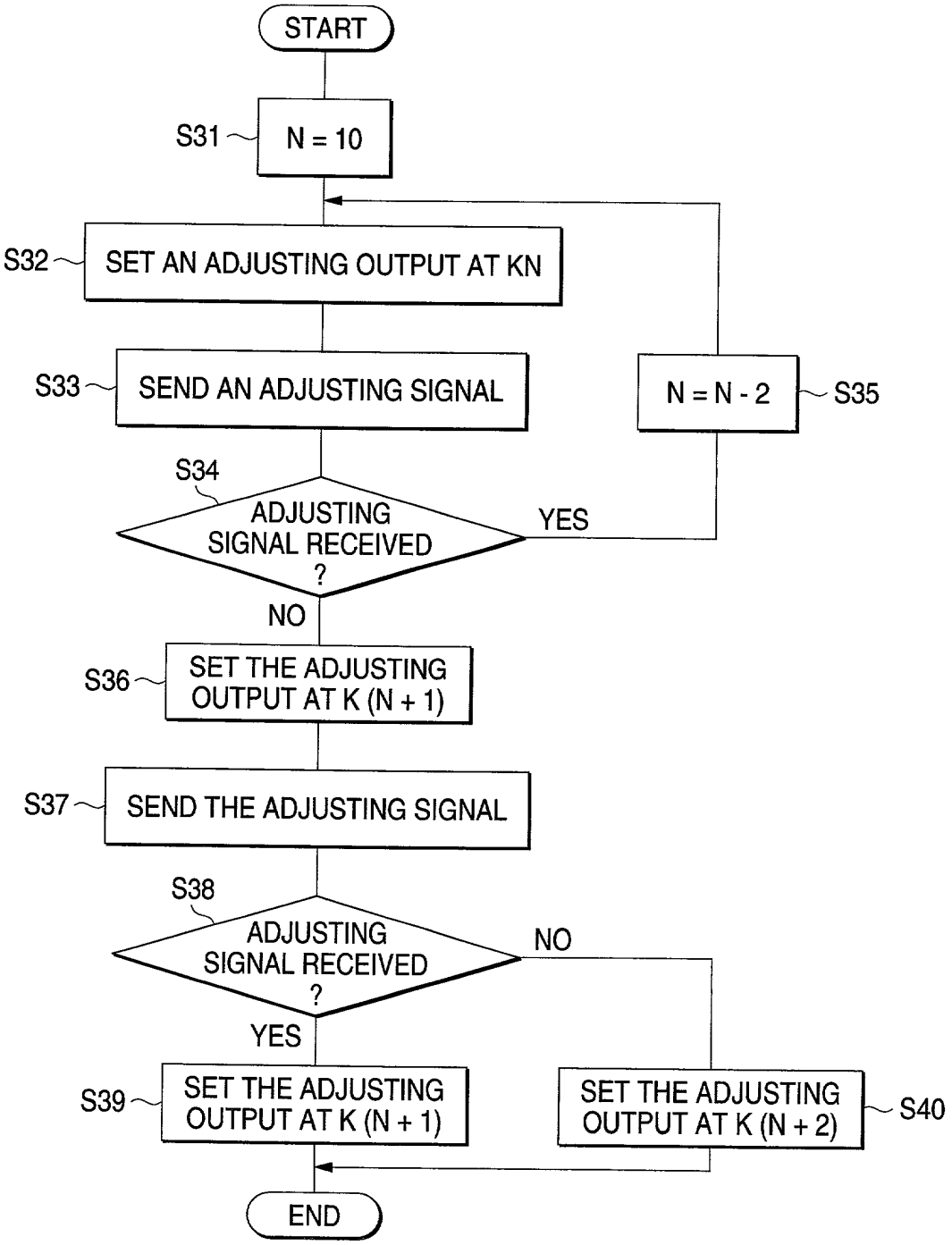

START
S31
N = 10
S32
SET AN ADJUSTING OUTPUT AT KN
S33
SEND AN ADJUSTING SIGNAL
N = N - 2
S35
S34
ADJUSTING SIGNAL RECEIVED ?
YES
NO
S36
SET THE ADJUSTING OUTPUT AT K (N + 1)
S37
SEND THE ADJUSTING SIGNAL
S38
ADJUSTING SIGNAL RECEIVED ?
NO
YES
S39
SET THE ADJUSTING OUTPUT AT K (N + 1)
SET THE ADJUSTING OUTPUT AT K (N + 2)
S40
END

FIG. 8A

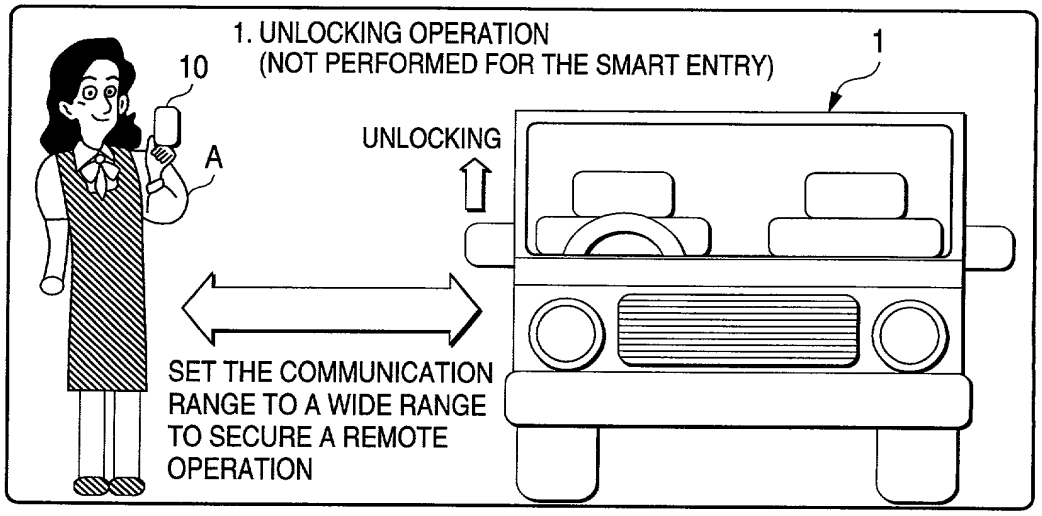


FIG. 8B

2. GET IN THE VEHICLE WHILE CARRYING THE PORTABLE DEVICE. AT THIS TIME, SPECIFY A POSITION OF THE PORTABLE DEVICE AND ITS MOTION.

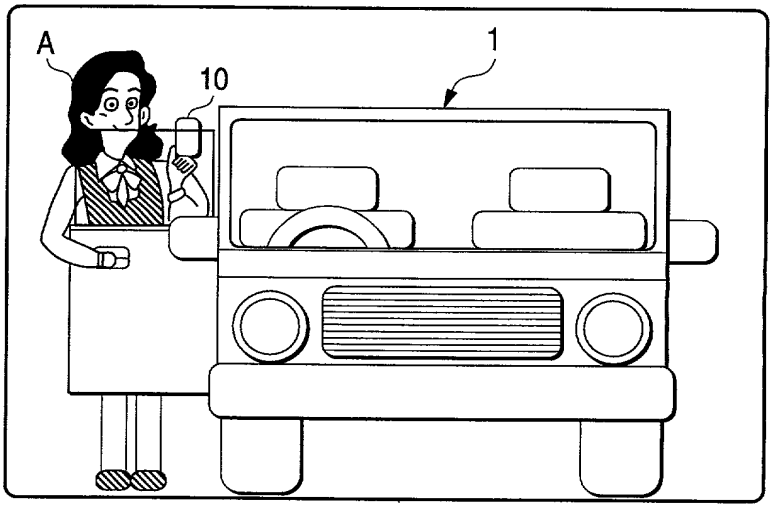


FIG. 8C

3. MAKE AN AUTHENTICATION FOR THE PERMISSION OF ENGINE START. SELECT THE NARROWEST COMMUNICATION RANGE (IN-CABIN COMMUNICATION RANGE) NECESSARY FOR THE AUTHENTICATION.

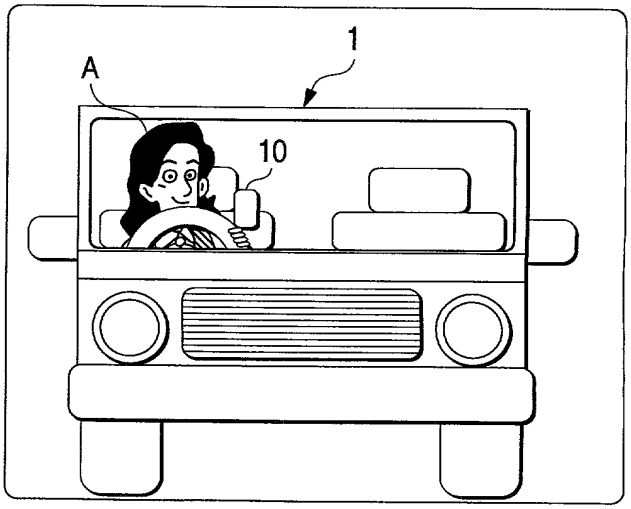


FIG. 9A

1. THE USER HOLDS THE PORTABLE DEVICE, AND THE DEVICE HAS AN AUTHENTICATION CODE.

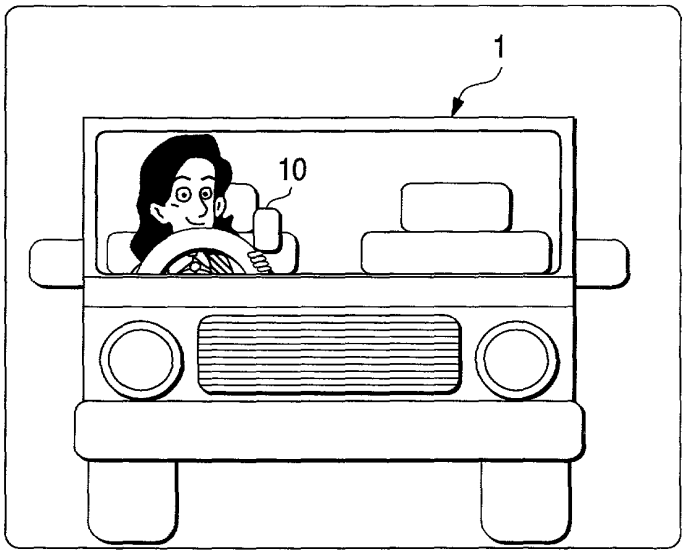


FIG. 9B

2. GET OFF THE VEHICLE WHILE HOLDING THE PORTABLE DEVICE. AT THIS TIME, SPECIFY A POSITION OF THE PORTABLE DEVICE AND ITS MOTION.

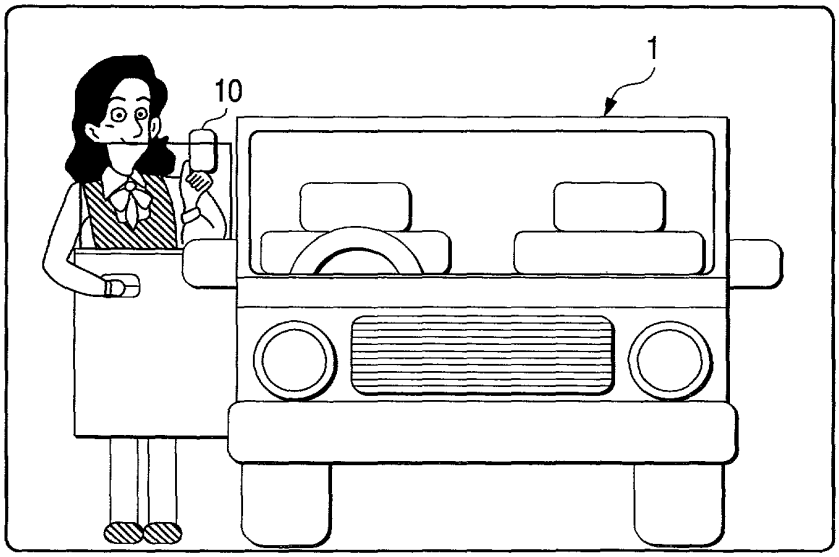


FIG. 10A

3. LEAVE VEHICLE WHILE HOLDING THE PORTABLE DEVICE. AT THIS TIME, DETECT THE USER GETS OFF THE VEHICLE, FROM THE PORTABLE DEVICE'S MOTION.

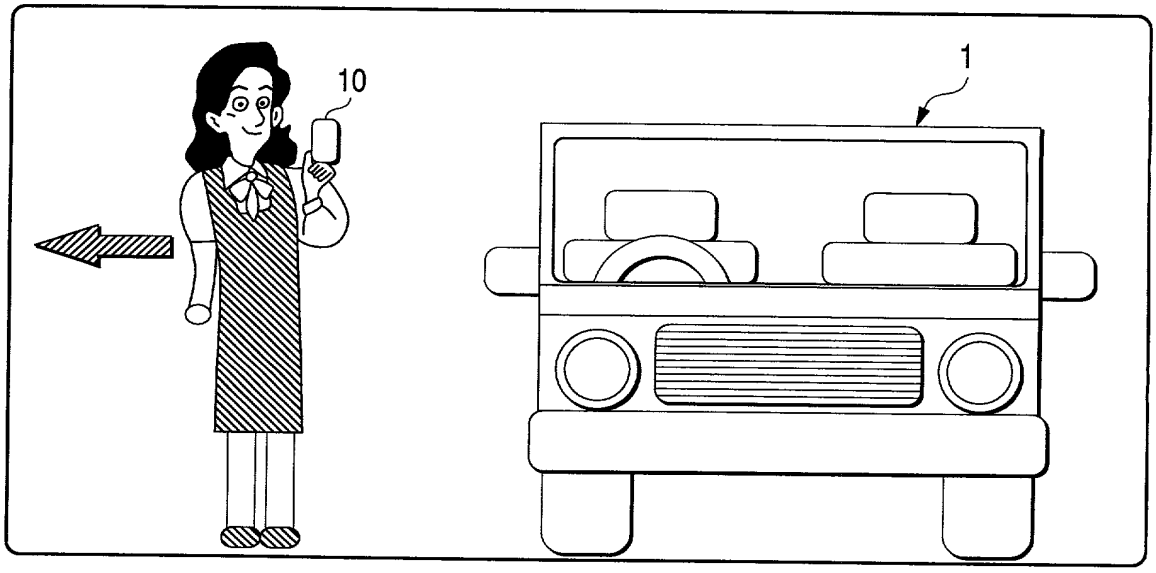
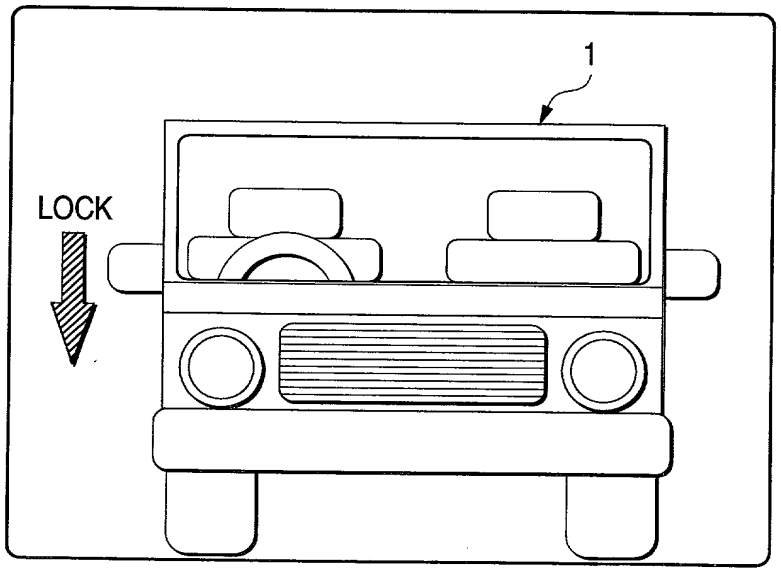


FIG. 10B

4. THE STATIONARY DEVICE CANNOT COMMUNICATE WITH THE PORTABLE DEVICE, AND RECOGNIZES THAT THE PORTABLE DEVICE IS NOT WITHIN THE CABIN, AND LOCKS THE DOOR.